

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
United States Patent and Trademark  
Office  
Box PCT  
Washington, D.C.20231  
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

<b>Date of mailing</b> (day/month/year) 04 January 2000 (04.01.00)	
<b>International application No.</b> PCT/NO99/00123	<b>Applicant's or agent's file reference</b> P9826
<b>International filing date</b> (day/month/year) 16 April 1999 (16.04.99)	<b>Priority date</b> (day/month/year) 17 April 1998 (17.04.98)
<b>Applicant</b> OVERÅ, Sverre, Johannesen et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

09 November 1999 (09.11.99)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was  
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

/

<p>The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No.: (41-22) 740.14.35</p>	<p>Authorized officer A. Karkachi</p> <p>Telephone No.: (41-22) 338.83.38</p>
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## PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

**NOTIFICATION CONCERNING  
SUBMISSION OR TRANSMITTAL  
OF PRIORITY DOCUMENT**

(PCT Administrative Instructions, Section 411)

To:

HOFSETH, Svein  
Norsk Hydro ASA  
N-0240 Oslo  
NORVÈGE

Date of mailing (day/month/year) 28 May 1999 (28.05.99)	
Applicant's or agent's file reference P9826	<b>IMPORTANT NOTIFICATION</b>
International application No PCT/NO99/00123	International filing date (day/month/year) 16 April 1999 (16.04.99)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 17 April 1998 (17.04.98)
Applicant NORSK HYDRO ASA et al	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An **asterisk(\*)** appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The **letters "NR"** appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
17 April 1998 (17.04.98)	19981734	NO	14 May 1999 (14.05.99)

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

Aino Metcalfe 

Telephone No. (41-22) 338.83.38

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P9826	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/NO99/00123	International filing date (day/month/year) 16/04/1999	Priority date (day/month/year) 17/04/1998
International Patent Classification (IPC) or national classification and IPC F17C13/12		
Applicant		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand  09/11/1999	Date of completion of this report  14.08.00
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Krysta, D  Telephone No. +49 89 2399 2942



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/NO99/00123

**I. Basis of the report**

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

**Description, pages:**

1-5 as originally filed

**Claims, No.:**

1-4 as originally filed

**Drawings, sheets:**

1/2-2/2 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/NO99/00123

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims 1-4
	No: Claims
Inventive step (IS)	Yes: Claims 2,3
	No: Claims 1,4
Industrial applicability (IA)	Yes: Claims 1-4
	No: Claims

**2. Citations and explanations**

**see separate sheet**

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**Point V:**

1. Document WO94/25541 (=D1) discloses a

"process plant for handling combustible fluids, for example an oil production plant in which gaseous hydrocarbons are separated (12,18,22) from oil and in which surplus gases or residual gases from uncontrolled build-ups of gas pressure in the process escape through process or safety valves (42,44,46) in the plant and are conducted to a collection line (33,40), wherein the surplus or residual gases are conducted via the collection line (33,40)" in order to be reinjected via the collection line (40) into a reservoir or to a plant at sea or land installation (see page 6, line 9 to 12), i.e. said gases are conducted via the collection line (33,40) "to a ... store having a connection line or return line to the process or another treatment unit for processing the returned or collected fluid."

It is obvious that said store/reservoir e.g. of a land installation can be "one or more low-pressure stores".

Therefore, claim 1 is not inventive (Article 33(3) PCT).

2. The additional features of dependent claim 4 are also known from D1 and, therefore, do not add an inventive step (Article 33(3) PCT).
3. The basic distinguishing aspect of the invention seems to be to reintroduce the surplus or residual gases to the crude oil or raw product low-pressure store(s). As a result the usually necessary flare tower can be eliminated.

**Point VIII:**

1. Statements in the description which are contradicting to the claims (see e.g. page 4, last paragraph) have to be deleted (Article 6 PCT).

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 99/00123

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: F17C 13/12, F25J 1/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: F17C, F25J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9425541 A1 (DEN NORSKE STATS OLJESELSKAP A.S.), 10 November 1994 (10.11.94), page 7, line 14 - line 23  -- -----	1-4

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

17 June 1999

Date of mailing of the international search report

08-07-1999

Name and mailing address of the ISA

Swedish Patent Office  
Box 5055, S-102 42 STOCKHOLM

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Authorized officer

Jan Carlerud/MP

Telephone No. +46 8 782 25 00

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/NO 99/00123

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9425541 A1	10/11/94	AU 6659394 A	21/11/94
		GB 2293000 A,B	13/03/96
		GB 9522621 D	00/00/00
		NO 177161 B,C	18/04/95
		NO 931596 A	04/11/94
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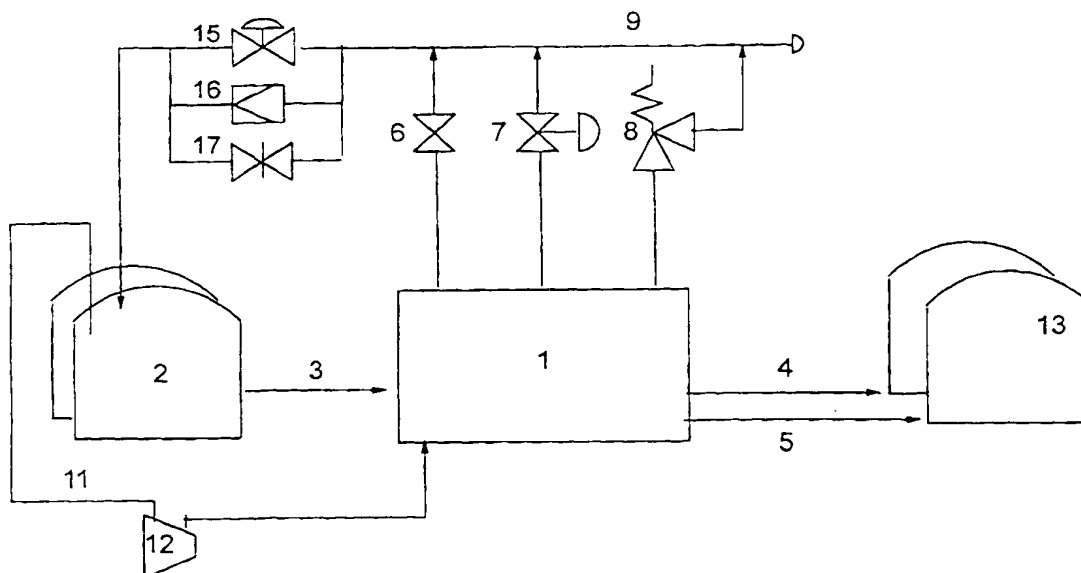




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>F17C 13/12, F25J 1/00</b>		A1	(11) International Publication Number: <b>WO 99/54658</b>
			(43) International Publication Date: 28 October 1999 (28.10.99)
(21) International Application Number: PCT/NO99/00123 (22) International Filing Date: 16 April 1999 (16.04.99) (30) Priority Data: 19981734 17 April 1998 (17.04.98) NO (71) Applicant (for all designated States except US): NORSK HYDRO ASA [NO/NO]; N-0240 Oslo (NO). (72) Inventors; and (75) Inventors/Applicants (for US only): OVERÅ, Sverre, Johannesen [NO/NO]; Aspeggaugveien 10 A, N-0376 Oslo (NO). SALATER, Per [NO/NO]; Maridalsveien 64-6, N-0458 Oslo (NO). (74) Agent: HOFSETH, Svein; Norsk Hydro ASA, N-0240 Oslo (NO).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> With international search report.	

(54) Title: PROCESS PLANT



## (57) Abstract

A process plant (1) for handling combustible fluids, for example an oil production plant in which gaseous hydrocarbons are separated from oil and in which surplus gases or residual gases from uncontrolled build-ups of gas pressure in the process escape through process or safety valves in the plant and are conducted to a collection line (9). The surplus or residual gases are conducted via the collection line (9) to one or more low-pressure stores (2) and a connection line or return line (11, 3) is arranged from the store(s) (2) to the process or another treatment unit for processing the returned or collected fluid. The low-pressure store(s) can expediently comprise the crude oil or raw product store (2) of the process plant upstream of the process plant.

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Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
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### Process plant

The present invention relates to a process plant for handling combustible fluids, for example an oil production plant in which gaseous hydrocarbons are separated from oil and in which surplus gases or residual gases from uncontrolled build-ups of gas pressure in the process escape through process or safety valves in the process plant and are conducted to a collection line.

It should be stressed that the expression process plant means not only plants for oil production in which hydrocarbon gases are separated from oil, but also refining plants and all types of equipment or plant in which combustible fluids are formed which must be handled optimally in terms of safety, finance and the environment.

In a process plant, for example a plant for the production of oil, there will normally be a large number of separators, compressors and/or other process equipment which are connected, in the process pipe line system, with valves, pressure regulators, temperature regulators and other components which, in given situations, may fail and lead to leaks, uncontrolled build-up of pressure, etc. The plant therefore has integral safety systems in the form of pressure control valves, safety valves and blow down valves which are connected to and will conduct surplus or residual fluids to a collection line for further transport to a flare for burning or emission into the atmosphere. In connection with flare burning, a combustion gas is usually added to the collection line continuously to ensure that a minimum flame is maintained in the flare. In connection with emission into the atmosphere without burning, an inert gas is usually added to prevent explosion.

British patent application no. 2.066.936 describes a refining plant for oil in which surplus gases in the form of hydrocarbons are recovered. The surplus gases are diverted from a flare line system and condensed in one or more stages by compression and cooling. The condensate is returned to the process. The residual gas, however, is conducted to a flare tower and burned.

East German patent specification no. 266.006 mentions a plant for combining combustible gases from several sources with different compositions in two main streams. The gases are combined using a computer which regulates the mixture on the basis of measurements of the calorific value of the gases. The gases are burned in a flare tower.

Moreover, Norwegian patent no. 177161 describes a solution for recovering surplus gas from an oil/gas treatment plant in which the surplus gas is collected in a collection line and recovered while gas which escapes in an emergency situation in connection with an abnormal increase in pressure (blow out) is conducted to a branch line for burning in a flare tower.

For all of the above known solutions, flares are used to burn all or part of the surplus gases or residual gases from the process plant. However, the use of a flare entails several disadvantages:

- The construction of the flare (flare tower) in itself is very expensive and will account for a not inconsiderable part of the overall costs of a process plant.
- Burning or emitting the surplus gases represents an environmental problem as CO<sub>2</sub> and hydrocarbon gases will, among other things, contribute to the greenhouse effect.
- The surplus gases or fluids are valuable in themselves and represent a direct financial loss when burned or emitted into the environment.

The present invention describes a device in connection with a process plant in which the stated disadvantages have been eliminated, i.e. in which the flare has been removed and all surplus gases and residual gases are dealt with and recycled.

The present invention is characterised in that the surplus or residual gases are conducted via a collection line to one or more low-pressure stores and that a connection line or return line is arranged from the store's gas area to the process or another treatment unit for the processing of the gas.

Claims 2-3 define advantageous features of the invention.

The present invention will be described in the following in further detail by means of examples and with reference to the attached drawings, where

Fig. 1 shows a simplified process diagram for a traditional process plant with a flare tower.

Fig. 2 shows a simplified process diagram for a process plant in accordance with the present invention without a flare tower.

Fig. 1 shows, as stated, a simplified process diagram of a traditional process plant, for example an oil production plant, in which a flare tower is used to burn the surplus gases. The raw product or crude oil is added to the process 1 from one or more low-pressure crude oil stores 2 via a line 3. The process itself may comprise several process stages with compressors and condensers (not shown) and is designed to separate gaseous hydrocarbons from the oil and transfer them as processed products, for example via lines 4, 5, to an appropriate product store 13.

A process plant like this will, as stated in the introduction, contain equipment and components, for example valves, pressure regulators and temperature regulators, which may fail and lead to leaks and build-ups of pressure. The plant will, therefore, be fitted with blow down valves (BDV), pressure control valves (PV) and pressure safety valves (PSV) 6, 7, 8, which are designed to allow fluid (gas) to escape in

connection with a shutdown and when unforeseen leaks or build-ups of pressure occur. These fluids are collected in a collection line 9 and conducted to a flare tower 10 for burning or emission into the atmosphere. In the latter case, inert gas is also added from an inert gas source (not shown) via line 14.

Fig. 2 shows a simplified process diagram of the solution in accordance with the present invention. The process is the same as in the example shown in Fig. 1 and described above but the flare tower has been eliminated by the fluid which is collected in the collection line 9 being returned to the low-pressure crude oil store 2 upstream of the process plant.

Surplus gases which are collected in the store 2 can expediently be returned to the process as gas for reuse via line 11. If the conditions are present, some of the gas will condense in the low-pressure store 2. This condensed gas and any liquid from the fluid can expediently be returned to the process via the raw product line 3. In order to create lower pressure and thus increased capacity in the store 2, a fan or compressor 12 can also be arranged in connection with the return line 11. It should be noted that the present invention will require a relatively large store volume to be able to work within fixed safety margins. Such a volume will usually exist at all major crude oil plants.

However, it should also be noted that the present invention as it is described in the claims is not restricted to a solution in which the surplus gases or fluids have to be conducted to the low-pressure product store. It is possible to establish a separate store volume, for example a separate tank to which the surplus gases are conducted. Moreover, the collected gas or fluid (liquid) does not have to be returned to the process but can be conducted to another separate treatment unit (not shown). Moreover, a control valve 15 should be arranged in connection with the collection line 9 in order to isolate the low-pressure store 2 from the process when the plant is not in operation. Moreover, surplus pressure protection 17 should be arranged in parallel with the control valve 15 in case the latter fails to open. A manual stop valve (diverter

valve) 17 should be used to allow maintenance of the control valve 15 and the surplus pressure protection 17.

The present invention describes a solution in connection with a process plant which has a number of advantages compared with the known solutions:

- The use of a flare tower with associated equipment is completely eliminated and the investment costs in connection with the construction of the process plant and the maintenance costs are therefore considerably less.
- By eliminating the use of a flare, emissions of environmentally hazardous hydrocarbon gases, CO<sub>2</sub> and NO<sub>x</sub> gases are avoided. At the same time, major savings are achieved as there will be no need to add gas to the pilot flare and as the surplus gases are returned to the process and "reused".
- As the construction of a flare tower is not necessary, the visually unattractive structure of the flare tower is also avoided. Moreover, the unattractive flare, the high noise level and the smoke which are associated with the use of a flare are also avoided.
- Moreover, the present invention offers an improvement in safety, among other things because the use of an open flame is eliminated and the relief of surplus pressure built up will be shorter?.

## Claims

1. Process plant (1) for handling combustible fluids, for example an oil production plant in which gaseous hydrocarbons are separated from oil and in which surplus gases or residual gases from uncontrolled build-ups of gas pressure in the process escape through process or safety valves in the plant and are conducted to a collection line (9).  
characterised in that  
the surplus or residual gases are conducted via the collection line (9) to one or more low-pressure stores (2) and that a connection line or return line (11, 3) is arranged from the store(s) (2) to the process or another treatment unit for processing the returned or collected fluid.
2. Process plant according to claim 1,  
characterised in that  
the low-pressure store(s) comprise(s) the crude oil or raw product store (2) of the process plant upstream of the process plant.
3. Process plant according to claim 1,  
characterised in that  
the return line (11) is connected to the gas area of the raw product store and that any condensed gas and liquid from the fluid which is added to the store (2) via the collection line (9) is returned to the process via the raw product line (3).
4. Process plant according to claim 3,  
characterised in that  
a fan or compressor (12) is arranged in connection with the return line (11).



1/2

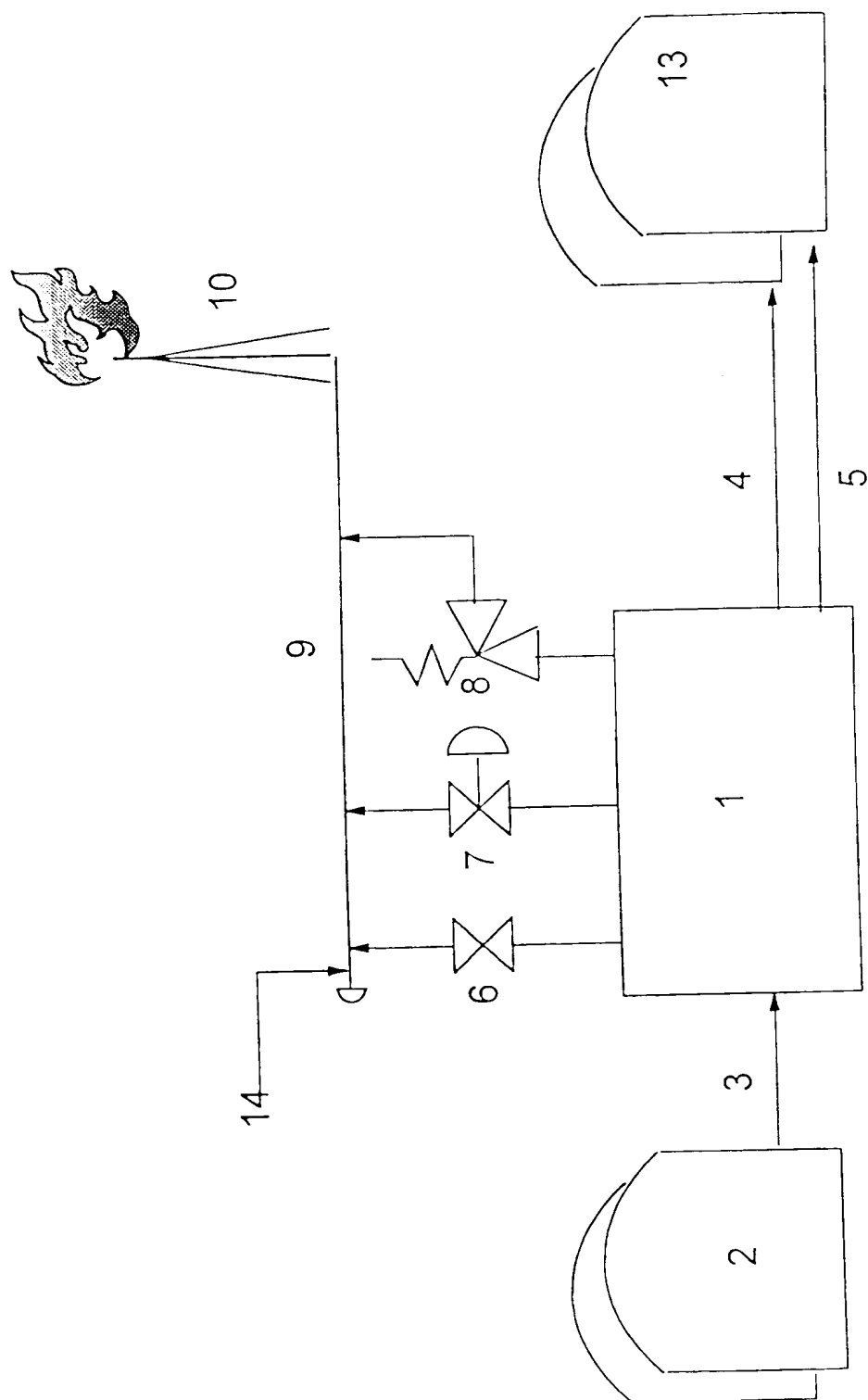


Fig.1

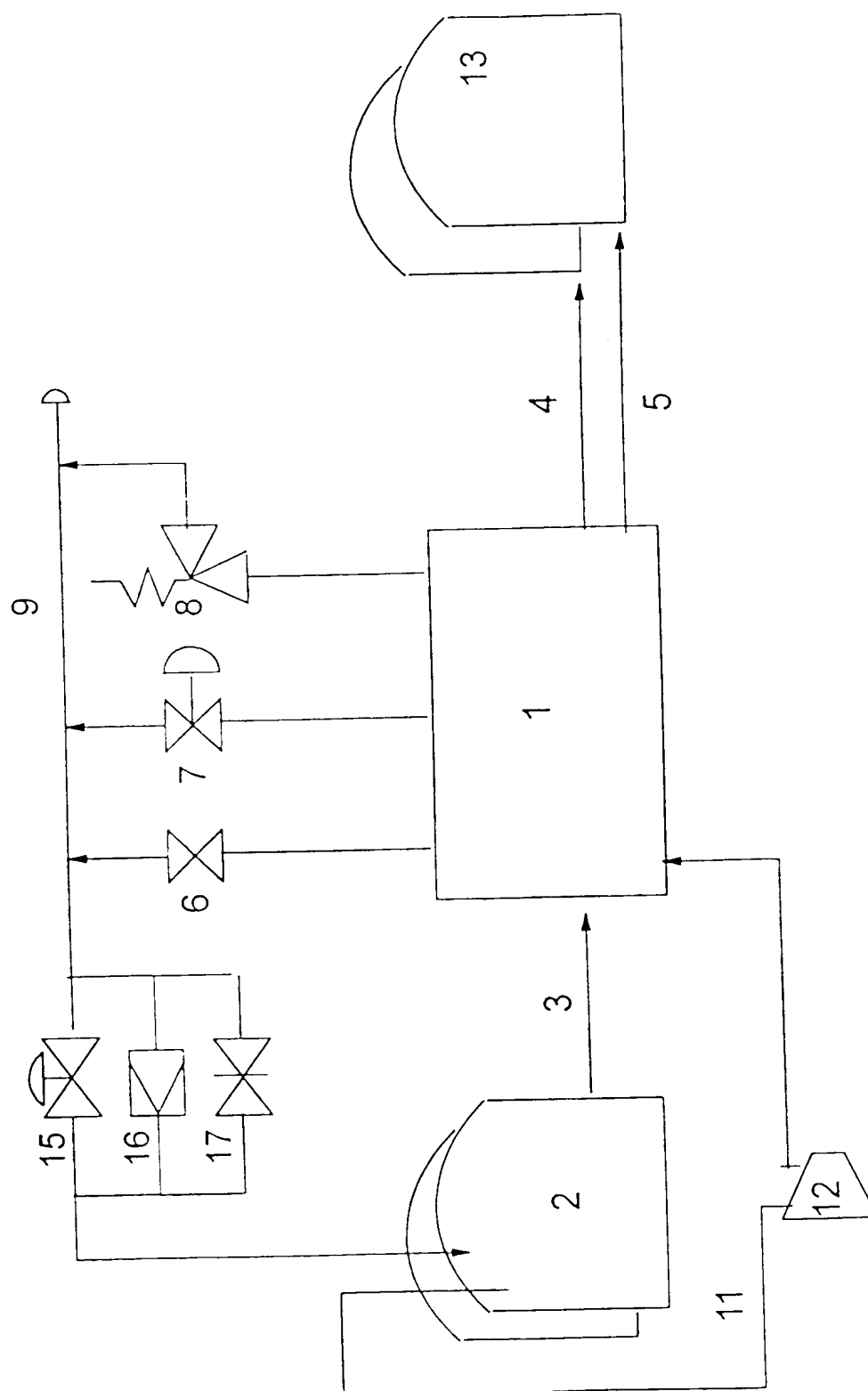


Fig. 2